Remarks

Applicant respectfully requests reconsideration of the Applicant's application in view of the amendments and arguments presented herein.

Applicant and Applicant's undersigned attorney wish to thank the examiner for the courtesy she showed to Applicant's undersigned attorney during the personal interview that was conducted at the Office on November 25, 2008. During that interview, the examiner and Applicant's undersigned attorney discussed the outstanding rejections in view of Storchheim (U.S. Pat. No. 3,366,479) and what amendments to the instant claims would be necessary to overcome the outstanding rejections. Applicant's undersigned attorney proposed to amend claim 1 to (1) limit the heating atmosphere to consist of nitrogen and water vapor, (2) to include the density limitation of claim 17 during the heating step of claim 1, and (3) to limit the powder not being pressed by mechanical force prior to or during the heating step. Applicant's undersigned attorney also proposed to cancel claims 17 and 21-29. The examiner expressed the opinion that the proposed amendments appear to overcome the prior art of record, subject to a further search.

Applicant herein makes the above-identified amendments to claim 1 and cancels claims 17, and 21-29.

Applicant believes the amendments are supported by the as-filed application and contain no new matter. More specifically, the first amendment identified above is supported at, for example, in the examples of the present invention described in paragraphs [0048] through [0058] of the instant application wherein the atmospheres consisted of nitrogen and water vapor within the claimed range; the second amendment

identified above is supported at, for example, in original claim 17 of the instant application; and the third amendment identified above is supported at, for example, in the examples of the present invention described in paragraphs [0048] through [0058] of the instant application wherein no mechanical force was applied to the powder samples prior to or during the heating step.

As was discussed during the interview, Applicant believes that the amendments to claim 1 overcome the rejections for the following combination of reasons.

First, although Storchheim teaches using a sintering atmosphere comprising nitrogen plus water vapor, Storchheim does not teach using an atmosphere consisting of nitrogen and water vapor. What Storchheim teaches with regard to nitrogen is:

> Nitrogen-containing inert atmospheres such as dissociated ammonia can be used, but generally are not completely satisfactory unless magnesium is one of the metallic components employed.

Storchheim at column 9, lines 15-18 (emphasis added). The cited passage directly follows Storchheim's defining the term "inert atmospheres" to include reducing atmospheres, such as those including hydrogen. Dissociated ammonia, of course, is a reducing atmosphere.[1] Furthermore, Storchheim does not name "nitrogen" in its list of single-component inert gases (excepting the water vapor, of course), but instead names the gases helium, argon, krypton, xenon, and krypton, the last three of which are very rare and expensive. *Id.* at column 9, 13-14. If Storchheim had meant to include nitrogen as a single component inert gas, a person skilled in the art would find it to be very odd that Storchheim did not include this very abundant, inexpensive and commonly-used

[1] Although it was not discussed during the interview, Applicant respectfully points out that the composition of dissociated ammonia is, on a volumetric basis, 75 percent hydrogen and 25 percent nitrogen. Thus, dissociated ammonia does not even consist primarily of nitrogen gas, but, rather, consists primarily of hydrogen gas.

industrial gas in its list. Also, in Storchheim's experimental examples, the only "nitrogen-containing" sintering atmosphere used is dissociated ammonia. Accordingly, Applicant respectfully submits that a person of ordinary skill in the art would not understand Storchheim to teach the use of an atmosphere consisting of nitrogen and a partial pressure of water vapor in the range of about 0.001 kPa to about 0.02 kPa as amended claim 1 requires.

Second, Storchheim does not teach that a sintered relative density of at least about 60% can be achieved without pressing the powder together by a mechanical force prior to or during the step of heating, as is required by amended claim 1. Instead, Storchheim teaches that the application of a mechanical force to the powder in the form of a compaction pressure of 3-40 t.s.i. (i.e., 6,000 to 80,000 pounds per square inch) will result in sintered densities in the range "as low as 60% or less of theoretical density to over 95% of theoretical." Storchheim at column 7, lines 11-16. Storchheim goes on to state:

> Thus there can be seen that for porous products, the compaction pressure employed will range from 0 up to about 5 t.s.i., while for high strength, substantially non-porous products, the compaction pressure will range from about 5 up to 30 t.s.i.

Id. at column 7, lines 47-51 (emphasis added). Note that Storchheim defines a "porous product" as "generally one, which after compaction, exhibits a density of up to 85%." *Id.* at column 7, lines 28-31. Taking these teachings of Storchheim together, Applicant respectfully submits that a person of ordinary skill in the art would understand Storchheim to be teaching that the application of a mechanical force to the powder in the form of a compaction pressure of over 5 t.s.i. (i.e., 10,000 pounds per square inch) is required in order to obtain a non-porous article having a theoretical density of over 85%

and a compaction pressure of at least 3 t.s.i. (i.e., 6,000 pounds per square inch) to achieve density above about 60%.

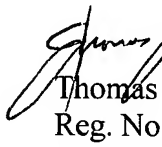
Third, Applicant's inventive process as claimed by amended claim 1 achieves multiple unexpected results as demonstrated by the examples presented in the instant application. One of the unexpected results is that the method claimed in claim 1 sinters pure aluminum to a high relative density in an atmosphere consisting of nitrogen with a small amount of water vapor. Examples 1 and 2 of the instant application (paragraphs 0050 – 0052) describe the surprisingly good results for the inventive method using pure aluminum powder in a nitrogen atmosphere to yield sintered aluminum articles having theoretical densities in the range of 75-83%. In contrast, the passage from Storchheim at column 9, lines 15-18, quoted above teaches away from the use of a nitrogen-containing sintering atmosphere when magnesium is not one of the metallic components employed.

Another unexpected result of the instant invention is that the claimed method achieves a high sintered relative density without the use of the application of a compaction pressure to the powder. For example, Example 5 of the instant application shows the surprising result that densities in excess of 99% have been achieved by the claimed method without the use of compaction. In contrast, Storchheim teaches that the use of a compaction pressure of 3-40 t.s.i. will result in sintered densities in the range "as low as 60% or less of theoretical density to over 95% of theoretical." Storchheim at column 7, lines 11-16.

Thus, Applicant respectfully submits that the amended claims are neither anticipated by nor obvious in view of Storchheim either alone or in combination with any

of the other art of record. Accordingly, Applicant respectfully requests that the outstanding rejections be withdrawn and the claims be allowed.

Respectfully submitted,



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November 28, 2008